## Lclaim:

- 1 1. A method for shaping surfaces comprising the steps of using
- 2 reactive atom plasma processing for shaping damage free surfaces.
- 1 2. The method of claim 1 wherein the process is carried out at about
- 2 atmosphere temperature.
- 1 3. The method of claim 1 for shaping optical elements.
- 1 4. The method of claim 1 for shaping elements out of silicon.
- 1 5. The method of claim 1 for shaping silica glass optics.
- 1 6. The method of claim 1 for shaping aspheric optics.
- 1 7. The method of claim 1 operating in a subtractive manner.
- 1 8. The method of claim 1 that does not leave behind a contaminated
- 2 redeposition layer.
- 1 9. The method of claim 1 using a plume of plasma.
- 1 10. The method of claim 1 using a plume of plasma operating as a sub-

- 2 aperture tool.
- The method of claim 1 wherein a plume of plasma is translated
  across a workpiece.
- 1 12. The method of claim 1 wherein the emission spectrum is monitored2 to determine process rates.
- 1 13. The method of claim 1 using carbon tetrafluoride (CF<sub>4</sub>) in argon to create the plasma.
- 1 14. The method of claim 1 using  $C_2F_6$  in argon to create the plasma.
- 1 15. The method of claim 1 using silicon hexafluorine (SF<sub>6</sub>) in argon to create the plasma.
- 1 16. An apparatus for shaping surfaces comprising:
- 2 a chamber;
- a torch located in a chamber that can produce a plume of plasma;
- 4 a device that holds a workpiece; and
- 5 a mechanism for translating the torch across the workpiece.
- 1 17. The apparatus of claim 15 including:

- 2 a device for tuning the plasma.
- 1 18. The method of claim 1 operating an additive manner.
- 1 19. The method of claim for removing damage introduced by previous
- 2 process steps.
- 1 20. The method of claim 1 for removing surface roughness.